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GNRO-2015/00019

April 08, 2015

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Licensee Event Report (LER) 2015-001-00 Automatic Actuation of the Reactor Protection System (RPS) Due to a Main Turbine Trip
Grand Gulf Nuclear Station
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2015-001-00 which is a 60 day final report. This report is submitted in accordance with Title 10 Code of Federal Regulations 50.73(a)(2)(iv)(A).

This letter contains no new commitments. If you have any questions concerning this submittal, please contact Mr. James Nadeau at (601) 437-2103.

Sincerely,

JJN/ss

Attachment: Licensee Event Report (LER) 2015-001-00

cc: U.S. Nuclear Regulatory Commission
ATTN: Mr. A. Wang, NRR/DORL (w/2)
Mail Stop OWFN 8 B1
Rockville, MD 20852-2738

U.S. Nuclear Regulatory Commission
ATTN: Mr. Marc Dapas (w/2)
Regional Administrator, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

Attachment to
GNRO-2015/00019
Licensee Event Report (LER) 2015-001-00

NRC FORM 366 (01-2014) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Automatic Actuation of the Reactor Protection System (RPS) Due to a Fault in the Protective Relaying Circuitry on the "B" Main Transformer.

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	07	2015	2015	– 001 –	00	04	07	2015	N/A	05000 N/A
									FACILITY NAME: N/A	DOCKET NUMBER: 05000 N/A

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
James Nadeau / Manager, Regulatory Assurance	(601) 437-2103

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On Saturday, February 7, 2015, at 1856 hours Central Standard Time, with the plant at 100 percent thermal power, Grand Gulf Nuclear Station experienced an automatic actuation of the reactor protection system (RPS) and subsequent reactor SCRAM. The "B" main transformer differential trip caused a generator lockout. The generator lockout was followed by a turbine control valve fast closure (RPS SCRAM signal), turbine trip and reactor SCRAM. All control rods fully inserted and safety systems operated as designed. Eleven safety relief valves (SRVs) lifted to control pressure. Feedwater was manually secured to transfer to the startup level control mode. There were no emergency core cooling systems (ECCS) actuations required or initiated in response to this SCRAM. Turbine bypass valves opened to stabilize pressure causing reactor water level to fluctuate. Residual heat removal (RHR) group 2 and 3 containment isolation signals were received on low level 3. A hard ground was discovered on the non-safety protective circuitry between the current transformer and control cabinet on "B" main transformer. The faulted cables and other similar cables were determinated and alternate wiring and conduit was installed before placing the transformers back into service. The event posed no threat to public health and safety.

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NARRATIVE

INITIAL CONDITIONS

Grand Gulf Nuclear Station (GGNS) Unit 1 was operating at 100 percent rated thermal power. All systems, structures and components that were necessary to mitigate, reduce the consequences of, or limit the safety implications of the event were available and no safety significant components were out of service.

DESCRIPTION

On Saturday, February 7, 2015, at 1856 hours central time the Grand Gulf Nuclear Station Unit 1 experienced a full load rejection due to a fault in the current transformer circuit on the "B" main transformer. Faulted wiring in a pull box resulted in a ground on the current transformer (CT) [XCT]. This ground was sensed by the transformer differential current relay and its magnitude was sufficient to create a trip signal to the main generator, creating a full load reject. The figures on pages 4 and 5 of this LER are provided as a visual aid to show the ground and damaged wiring.

The reactor protection system (RPS) and all safety systems functioned as designed and expected. The operators entered and followed the appropriate post scram procedures (Off-Normal Emergency Procedures for Reactor Scram, Turbine Generator Trip, and Emergency Operating Procedure (EOP) for Reactor Pressure Vessel (RPV Control)). No additional EOP's were required to be entered as part of the SCRAM response and no additional EOP operator actions were required beyond those associated with a normal SCRAM response. Safety relief valves (SRVs) responded to the initial pressure rise in the reactor caused by the turbine control valve (TCV) fast closure (load reject). Reactor pressure and level control were maintained using the feedwater system [SJ] and turbine bypass valves throughout the remainder of the event. No emergency core cooling system (ECCS) initiation signals were generated. All electrical systems functioned correctly. Reactor and drywell pressure were appropriately maintained throughout the event.

Following the SCRAM, reactor water level dropped (shrink) initiating a SCRAM signal on low level 3. This was an expected/designed response following fast closure of the TCVs which increased reactor pressure and collapsed voids. Subsequently, the SRVs and the turbine bypass valves opened at their respective setpoints to control pressure. The feedwater control system [JB] responded rapidly to the low water level signal, increasing reactor feed pump turbine (RFPT) [SJ] speed, injecting relatively cold feedwater into the reactor vessel. Reactor water level then increased as a result of the inventory supplied by the feedwater system [SJ] and the thermal expansion of the cold water as it mixed with the inventory in the reactor (swell).

In accordance with their training and procedures, the reactor operators noted the increase in reactor level and secured the "B" reactor feedwater pump [SJ]. This was accomplished within twenty-two (22) seconds following the SCRAM signal. However, reactor level continued to rise due to the swell of the volume already injected into the reactor and reached the level 9 trip for high reactor water level. This trip signal caused a termination of feedwater flow. Operators subsequently recovered the "A" RFPT [SJ] within 5 minutes following its trip and began to reestablish feedwater flow to the vessel. During this 5 minute time interval, reactor water level lowered to just below the level 3 setpoint. A second SCRAM signal was generated; however, control rod position and system response was not affected because the initial SCRAM signal had not been reset. The receipt of the level 9 and the second level 3 SCRAM signal is bounded by the existing UFSAR transient analysis for a full load rejection. Reactor water level was stabilized within the normal band at 1905 hours, 9 minutes after the initiation of the SCRAM.

NARRATIVE

EVENT CAUSE

The direct cause was a fault in the protective relaying circuitry on the "B" main transformer high voltage current transformer. The fault tripped the turbine differential relay generating a generator lockout signal to the main turbine, tripping it offline.

CORRECTIVE ACTIONS

The faulted cables and other similar cables were determinated and alternate wiring and conduit was installed The extent of condition involved replacing the wiring and conduit for the protective circuitry on both the high voltage and low voltage sides on all three recently installed single phase main transformers.

SAFETY SIGNIFICANCE

The event posed no threat to the health and safety of the public as RPS performed as designed. All safety systems responded as expected. No Technical Specification safety limits were challenged or violated. There were no ECCS actuations or malfunctions. The end of cycle/recirculation pump trip (EOC/RPT) to slow speed did occur as expected. The main steam isolation valves (MSIVs) [SB] operated as expected based on plant conditions. The operating crew entered the appropriate emergency and off normal procedures, as applicable. There was no radiological release or industrial safety hazard during the event.

BASIS FOR REPORTABILITY

This Licensee Event Report (LER) is being submitted pursuant to Title 10 Code of Federal Regulations 50.73(a)(2)(iv)(A) for an automatic actuation of the Reactor Protection System. Telephonic notification was made to the U.S. Nuclear Regulatory Commission (NRC) Emergency Notification System (ENS) on February 7, 2015, within 4 hours of the event, pursuant to 10CFR50.72(b)(2)(iv)(B) for RPS actuation.

SIMILAR EVENTS

Since the installation of the transformers in April 2012, there were two RPS SCRAMs on main turbine [TA] trips associated with CTs. These two events involved the current transformer for the main generator. The causes and corrective actions for each of these events were reviewed and it has been concluded that the corrective actions associated with these events would not have prevented the February 7, 2015 reactor SCRAM as reported in this licensee event report.

LER-2012-008-00 document the December 29, 2012 RPS actuation and reactor SCRAM. A second RPS reactor SCRAM was documented in LER 2013-001-00. The cause of both SCRAMS was because there was a partial grounding due to an inadequate clearance between the micarta plate bolts and the bottom of the current transformer as part of the physical installation of the CTs into the main generator bus work. Although these two events were attributed to installation techniques, the causes of the events were different. One was a structural/mechanical installation and the other was associated with concealed control wiring by the supplier.

NARRATIVE

MAIN TRANSFORMER DESCRIPTION:

The main transformers were installed in April 2012 to support extended power uprate (EPU). They are 510MVA, single phase, delta/wye configured step-up transformers, supplied 1525MVA from the main generator. They have a nominal low voltage rating of 22kV and the secondary high voltage windings supply 500kV to the switchyard. The main transformer relay protection system interfaces with the plant protection logic, computer and event recorder. Failure of the main transformers will not inhibit any plant safety-related system or prevent safe shutdown.

BACKGROUND ON INITIATING EVENT:

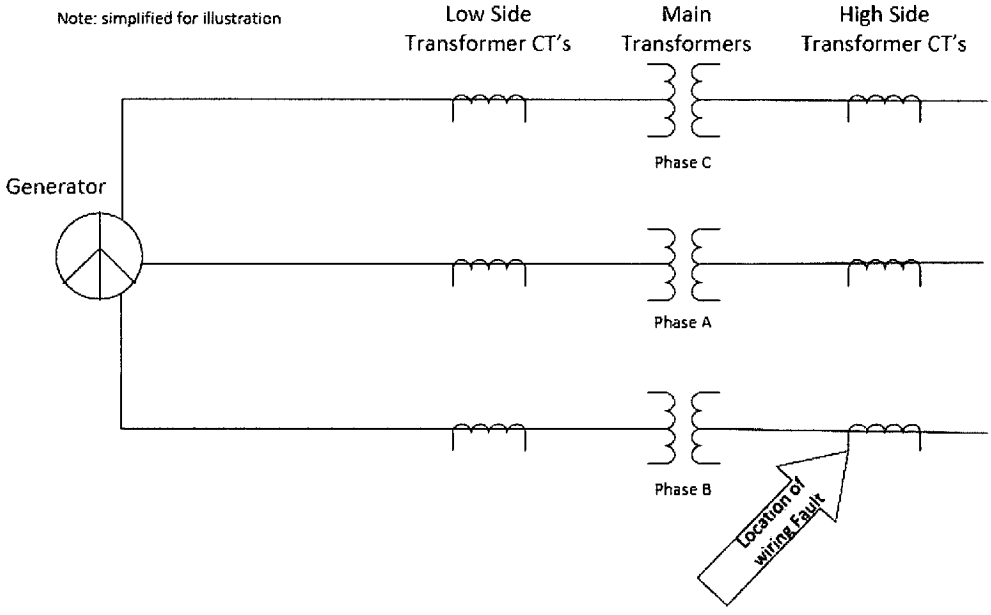
The high voltage side (500kV) CT wiring is normally grounded in the 801 panel in the control room. An unintentional, high voltage CT wiring ground developed inside the conduit mounted on top of "B" main transformer. The high voltage CT provides input to the transformer differential relay located in the control room. The differential relay is a protective relay that compares the difference in power between the high voltage side and low voltage side (22kV) of the transformer. The transformer is protected by actuation of the transformer differential relay and generator trip.

SUMMARY:

The trip signal was generated by the following events

1. A ground developed on the high voltage CT wire inside the conduit on top of the transformer. This ground created circulating ground currents between the normal ground in the control panel and the fault location on top of the transformer. This current caused localized heating that resulted in melting the other wiring in the conduit.

2. The change in current through the high voltage CT, without a change in the low voltage CT current, was detected by the transformer differential relay, resulting in relay actuation and subsequent generator trip.



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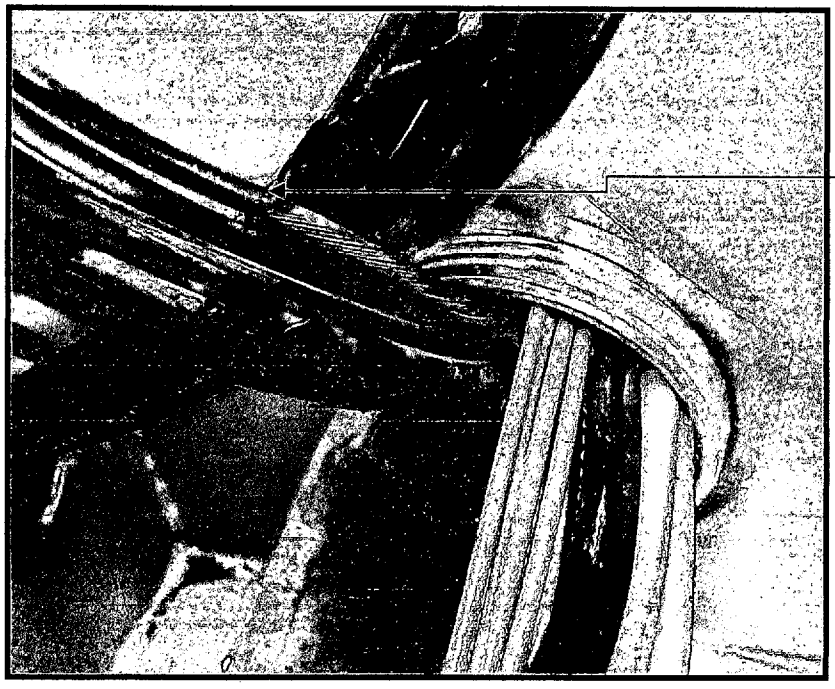

Damaged wiring was in pull box #3.

Corrective actions were taken to replace wiring and conduit